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<u>L16</u>	L14 and powder same polymer	38	<u>L16</u>
<u>L15</u>	L14 and powder polymer?	0	<u>L15</u>
<u>L14</u>	210/500.36.ccls.	316	<u>L14</u>
<u>L13</u>	I9 and low density polyethylene	1	<u>L13</u>
<u>L12</u>	L9 and ultrahigh	0	<u>L12</u>
<u>L11</u>	L9 and polyethylene same ultrahigh	0	<u>L11</u>
<u>L10</u>	L9 and polyethylene same ultrahigh	0	<u>L10</u>
<u>L9</u>	filter and filler and polyethylene oxide same powder	45	<u>L9</u>
<u>L8</u>	polyethylene same filter and polyethylene oxide same powder	0	<u>L8</u>
<u>L7</u>	polyethylene same filter and polyethylene oxide same powder	0	<u>L7</u>
<u>L6</u>	L4 and high density polyethylene	6	<u>L6</u>
<u>L5</u>	L4 and 210/500.1	0	<u>L5</u>
<u>L4</u>	powder same polyethylene oxide and filter and polyethylene	388	<u>L4</u>
<u>L3</u>	polyethylene oxide powder and filter	3	<u>L3</u>

<u>L2</u>	L1 and polyethylene oxide powder	0	<u>L2</u>
<u>L1</u>	polyethylene and filter material and ultrahigh molecular weight	21	<u>L1</u>

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L17: Entry 3 of 3

File: USPT

Aug 10, 2004

DOCUMENT-IDENTIFIER: US 6773797 B1

TITLE: Extruded poly (ethylene oxide) and filler composites and films having enhanced ductility and breathability

Brief Summary Text (14):

Prior art references have attempted to overcome these difficulties. U.S. Pat. No. 4,902,553 to Huang et al. discloses disposable articles comprising a liquid impermeable, vapor permeable film comprising a crystallizable, stretched polyolefin-based film and a rattle-reducing additive which may be polyethylene oxide. However, the liquid impermeable, vapor permeable films of U.S. Pat. No. 4,902,553 require at least one nucleating agent which may be talc or calcium carbonate. The amounts of nucleating agent are limited to very small amounts, 0.05 to 5 percent by weight. These amounts of inorganic nucleating agent are insufficient to be defined as fillers. Further, stretching is required to generate porosity and hence breathability and subsequent leaching of the rattle-reducing agent is the result. Additionally, these polyolefin films are not water-degradable and are therefore not useful in flushable applications. In contrast, the films of the present invention are based on a water-soluble or water-degradable polymer and not non-water-soluble and non-water-degradable polyolefins. The films of the present invention do not require a nucleating agent or a crystallizable polyolefin. Additionally, the films of the present invention may incorporate larger amounts, greater than 5 weight percent, of various filler(s).

Brief Summary Text (20):

The invention discloses composites comprising a water-soluble or water-degradable polymer and at least one filler. Films made from the compositions disclosed herein have increased porosity, thereby increasing the breathability and flushability of the films. The polymer component forms the matrix of the composite. Desirably, the water-soluble or water-degradable polymer is a polymer or copolymer of ethylene oxide. Desirably, the filler is selected from clays, calcium carbonate or mixtures thereof. When the selected filler is calcium carbonate, it is also possible to surface treat the calcium carbonate with a liquid organosilicone having a Hydrophilic-Lipophilic Balance (HLB) number ranging from about 6 to about 12. In one embodiment, the polymer is a poly(ethylene oxide) and the clay filler is from the smectite group. Desirable clay fillers include montmorillonites and bentonites, for example sodium montmorillonite. In another embodiment, polyethylene oxide is grafted with one or more polar vinyl monomers.

Detailed Description Text (15):

Suitable filler materials can be organic or inorganic, and are desirably in a form of individual, discrete particles. Suitable inorganic filler materials include metal oxides, metal hydroxides, metal carbonates, metal sulfates, various kinds of clay, silica, alumina, powdered metals, glass microspheres, or vugular void-containing particles. Particularly suitable filler materials include calcium carbonate, barium sulfate, sodium carbonate, magnesium carbonate, magnesium sulfate, barium carbonate, kaolin, carbon, calcium oxide, magnesium oxide, aluminum hydroxide, and titanium dioxide. Still other inorganic fillers can include those with particles having higher aspect ratios such as talc, mica and wollastonite.

Suitable organic filler materials include, for example, latex particles, particles of thermoplastic elastomers, pulp powders, wood powders, cellulose derivatives, chitin, chitozan powder, powders of highly crystalline, high melting polymers, beads of highly crosslinked polymers, organosilicone powders, and powders of super absorbent polymers, such as partially neutralized polyacrylic acid, and the like, as well as combinations and derivatives thereof. These filler materials can improve toughness, softness, opacity, vapor transport rate (breathability), water dispersability, biodegradability, fluid immobilization and absorption, skin wellness, and other beneficial attributes of the film.

Detailed Description Text (35):

The component materials employed to form the films having a porous structure may be suitably intermixed in powder or pellet form or otherwise combined by a conventional mixing and/or blending techniques. Desirably, the water-soluble polymer resin is mixed with the filler prior to melting. The mixture is then melt blended in a suitable apparatus, such as a blender, single screw extruder, twin-screw extruder, etc. In the Examples that follow, the process for blending the polymer resin and the fillers can also be utilized to produce the composites of the invention. Precursor films or sheets of the composites may be fabricated by convenient techniques such as compression molding and/or extrusion casting.

Current US Cross Reference Classification (2):

210/500.36

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L3: Entry 1 of 3

File: USPT

Nov 12, 2002

DOCUMENT-IDENTIFIER: US 6479001 B1

TITLE: Methods for making a thermoplastic composition including polyethylene oxide and fibers including same

Brief Summary Text (11):

Such a physical form or properties of the polyethylene oxide has been found to negatively impact the processing of the polyethylene oxide in several ways. First, any material, including polyethylene oxide, in a powder form is generally more difficult to process in terms of feeding and extrusion as compared to a material in a pelletized form, such as is typically encountered, for example, with polyolefins. Second, the high molecular weight of the polyethylene oxide typically results in significant entanglement of the polyethylene oxide polymer chains during certain processing techniques, such as extrusion. An extruder being used in such a situation will typically require a very large torque to feed the high molecular weight material through it which typically results in a pronounced "elastic-retraction" property of the molten fiber being processed which generally results in the molten fiber resisting being drawn down as it exits a spinneret attached to the extruder. These factors generally result in a very poor melt strength of the resultant fiber and make fiber spinning impracticable. Third, polyethylene oxide has a very low melting temperature, generally about 65.degree. C., which makes the polyethylene oxide difficult to solidify during quenching and which causes process difficulties due to the stickiness of fiber prepared from the polyethylene oxide.

Brief Summary Text (34):

Such a physical form or properties of the polyethylene oxide has been found to negatively impact the processing of the polyethylene oxide in several ways. First, any material, including polyethylene oxide, in a powder form is generally more difficult to process in terms of feeding and extrusion as compared to a material in a pelletized form, such as is typically encountered, for example, with polyolefins. Second, the high molecular weight of the polyethylene oxide typically results in significant entanglement of the polyethylene oxide polymer chains during certain processing techniques, such as extrusion. An extruder being used in such a situation will typically require a very large torque to feed the high molecular weight material through it which typically results in a pronounced "elastic-retraction" property of the molten fiber being processed which generally results in the molten fiber resisting being drawn down as it exits a spinneret attached to the extruder. These factors generally result in a very poor melt strength of the resultant fiber and make fiber spinning impracticable. Third, polyethylene oxide has a very low melting temperature, generally about 65.degree. C., which makes the polyethylene oxide difficult to solidify during quenching and which causes process difficulties due to the stickiness of fiber prepared from the polyethylene oxide.

Brief Summary Text (88):

The GPC is setup with two PLgel Mixed K linear 5 micron, 7.5.times.300 millimeter analytical columns in series. The column and detector temperatures are 30.degree. C. The mobile phase is HPLX grade tetrahydrofuran(THF). The pump rate is 0.8 milliliters per minute with an injection volume of 25 microliters. Total run time is 30 minutes. It is important to note that new analytical columns must be installed every 4 months, a new guard column every month, and a new in-line filter every month.

Brief Summary Text (98):

A differential refractometer, available from Viscotek Corporation under the designation Knauer Differential Refractometer with a Viscotek Differential Viscometer, Model 100, is set up with two linear, 120 Angstrom Waters Ultrahydrogel gas permeation chromatography columns having a flow rate of about 1.0 ml/minute and an injection volume of 100 microliters. The mobile phase is a 0.05M sodium nitrate aqueous solution. The mobile phase is filtered with a 0.45 micron filter and degassed using a vacuum and an ultrasound bath. Polyethylene oxide standards are obtained having narrow molecular weight distributions with known peak average molecular weight and intrinsic viscosity values.

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L6: Entry 4 of 6

File: USPT

Jun 1, 1999

DOCUMENT-IDENTIFIER: US 5908588 A

TITLE: Incipient flocculation molding of particulate inorganic materials

Brief Summary Text (12):

The most advantageous effect of replacing the molten wax or polymer with a liquid solvent is that the viscosity of the system is lowered significantly. The system has the rheological characteristics of an easily pourable slurry rather than a highly viscous dough-like mass. Consequently, the ceramic particles can be mechanically dispersed using a high shear-rate device such as a ball mill or an attritor mill. This enables the efficient elimination of powder agglomerates from the slurry. Conventional CPIM systems must be dispersed using a high-shear device such as a sigma-type mixer, often with limited success. Lower viscosity of the slurry renders it possible to filter the slurry to remove any undispersed agglomerates or foreign bodies. The elimination of the high molecular weight wax or polymer from the system also permits the use of finer (submicron) ceramic powders that possess superior structural properties in the sintered state.

Detailed Description Text (4):

More particularly, this invention relates to grafting dispersant such as polyethylene glycol (PEG), long-chain alcohols such as stearyl alcohol, polyacrylic acid (PAA) such as polymethacrylic acid, or modified cellulose such as methyl cellulose, hydroxy propyl cellulose, polyethylene oxide and the like. The dispersant used must possess temperature-dependent solubility in the processing liquid. It is particularly preferred to use dispersants such as polyethylene glycol (PEG) grafted to particulate inorganic powders such as alumina, stabilized zirconia, partially-stabilized zirconia, silicon carbide, silicon nitride, magnesia, titania and alumina-zirconia composite powders. The grafting procedures are described more fully later. The grafted powder is then mechanically dispersed in processing liquid such as ethanol, z-propanol, z-butanol and the like. The dispersant must possess temperature-dependent solubility in the process liquid. Particularly preferred processing liquids are either 2-propanol or 2-butanol (alcohol) or solutions of them in a closed container at approximately 65.degree. C., where the system is deflocculated and well dispersed by milling, filtering and deairing.

Detailed Description Text (11):

The preferred dispersant polyethylene glycol (PEG) compounds (Carbowax.RTM. PEG 600, PEG 1000, PEG 4600, PEG 8000, PEG compound 20M, Union Carbide Corporation, S. Charleston, W. Va.) used are of nominal molecular weights (M.sub.W) of 600, 1000, 4600, and 8000 respectively. Also used was PEG Compound 20M which consists of two PEG 8000 molecules linked by a di-epoxide linking group. PEG Compound 20M also contains an unspecified fraction of unlinked PEG 8000 molecules and trimolecular groups, and should be considered to have a multimodal molecular weight distribution.

Detailed Description Text (14):

Two methods were used to graft dispersants such as PEGs having various molecular weights as described above, to Type A and Type B alumina powders. The first grafting technique (coat-then-graft) involved coating the alumina powders with PEGs by dispersing them in an aqueous PEG solution followed by spray drying.

Alternatively, a series of dispersant-solvent systems can be used to disperse inorganic particulate materials. The dispersant-solvent systems include polyacrylic acid (as a dispersant) in 0.2M HCl solution; chemically modified cellulose, such as methylcellulose, hydroxypropyl cellulose or hydroxypropyl cellulose in aqueous solution; stearyl alcohol in benzene; polymethyl acrylic acid (PMAA) in aqueous solution; and polyethylene oxide in aqueous solution. The grafting reaction was completed by heating the granules in a vacuum oven. This technique uses standard processing equipment and was very efficient in its use of PEG. The second grafting technique (the molten-PEG reaction) involved dispersing alumina powders in an excess of molten PEG in a closed container which was backfilled with an inert gas like argon or nitrogen. The ungrafted PEG was removed by repeated washing with distilled water. This method used more PEG than the first method, but assured that a saturation level of PEG was available at the particle surfaces for the grafting reaction. It was possible to graft significant amount of PEG to the surface of ceramic powders using either of the above grafting methods. The polymer was strongly bonded to the ceramic particle surfaces and was not easily removed by severe agitation in a good solvent such as water. The grafting was accomplished using PEGs having different molecular weights. The grafting level, using the first method, reached an equilibrium value in approximately 4 hours of vacuum heating. The second method, resulted in a higher grafting level than the first method.

Detailed Description Text (19):

Several glass beakers containing about equal amount of PEGs having various molecular weight and Type A alumina powder were placed inside a vacuum oven and heated to about 180 to 210.degree. C., preferably at about 195.degree. C., for 15 to 30 hours, preferably for 24 hours, under flowing argon gas at 40 to 60 ml/min., preferably at 50 ml/min., to complete the grafting reaction. The excess ungrafted PEG was subsequently removed by repeatedly dispersing in distilled water, centrifuging and decanting the supernatant containing the free, ungrafted PEG. The sediments were re-dispersed in fresh distilled water by agitating in high density polyethylene (HDPE) plastic bottles for a few hours on a shaker table. Centrifuging was done for at least 4 hours, preferably for 10 hours, at 1500 to 2500 rpm, preferably at 2000 rpm, for each washing in order to sediment out the particles. The amount of ungrafted PEG remaining was estimated to be less than 0.004 wt. %. The washed sediments were dried in air for at least 20 hours, preferably for 32 hours at 50 to 70.degree. C. and then stored in air-tight plastic or glass containers.

Detailed Description Text (31):

Polyethylene glycols (PEGs) grafted to Type A and Type B alumina powders are good steric stabilizer dispersants in liquid media which are better-than-theta solvents for PEGs, including water and warm 2-propanol and warm 2-butanol. The best rheological properties for aqueous dispersions were realized for the powders with the highest levels of grafted PEG, which were presumed to approach a complete monolayer. The aqueous dispersions were all shear thinning. The rheological properties for concentrated aqueous dispersions of PEG-grafted Type A alumina improved in the following order of molecular weight: PEG 600<PEG 1000<PEG 8000<PEG 4600. Aqueous dispersions of PEG 600 and PEG 1000 grafted Type A alumina powder possessed discernible yield stresses.

CLAIMS:

4. The process of claim 1 wherein the dispersant is selected from the group consisting of polyethylene glycol, (methyl) cellulose, hydroxypropyl cellulose, polyacrylic acid, hydroxypropyl methylcellulose, stearyl alcohol, polymethacrylic acid, and polyethylene oxide, grafted to particulate inorganic powders.
5. The process of claim 4 wherein the dispersant is polyethylene glycol grafted to alumina.

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L9: Entry 39 of 45

File: USPT

Jul 11, 1978

DOCUMENT-IDENTIFIER: US 4100238 A

TITLE: Process for producing permeable membranes

Brief Summary Text (1):

This invention relates to a process for producing a permeable membrane from a polymer having stretchability, especially a permselective membrane suitable for use as a reverse osmosis membrane, a battery separator, a microbe-free packaging material, a filter, or the like.

Brief Summary Text (49):

If desired, suitable amounts of additives such as a filler (e.g., calcium carbonate, titanium dioxide, clay, magnesium carbonate, barium sulfate, diatomaceous earth or calcium sulfate), a fibrous substance such as polyester, nylon or glass fibers, an antioxidant, an ultraviolet absorber or a plasticizer may be added to components (A) and (B). Furthermore, if desired, the product in accordance with this invention may be subjected to a corona discharge treatment, oxidizer treatment or surfactant treatment.

Detailed Description Paragraph Table (1):

Table 2

Component (A) Component (B) Other component wt. wt. wt. Example Kind part Kind part

11

Polypropylene 30 Atactic polypropylene 70 none (MI = 7) (MI = 5) 12 Polypropylene 50 Nylon 6 50 none (MI = 2) (Toray Amilan CM1011) 13 Polypropylene 60 Poly(butene-1) 40 none (MI = 0.5) (MI = 10) 14 Polypropylene 70 Petroleum paraffin wax 30 none (MI = 0.3) (m.p. = 65.degree. C) 15 Polypropylene 40 Ethylene-propylene 60 Lubricant 5 (MI = 4) copolymer (ethylene/ (VLTN-5*) propylene 70/30 wt ratio, MI = 5) 16 Polyethylene 60 Ethylene-vinyl acetate 40 none (density 0.956, copolymer (vinyl acetate MI = 0.3) 25 wt.%, MI = 3) 17 Polyethylene 90 Petroleum microcrystalline 10 none (density 0.953, (m.p. 70.degree. C) MI = 3.5) 18 Polyethylene 40 Atactic polypropylene 60 none (density 0.943, (MI = 3) MI = 6) 19 Polyethylene 30 Ethylene-acrylic acid 70 none (density 0.956, copolymer (acrylic acid MI = 0.3) 20 wt.%, MI = 3) 20 Polyethylene 60 Nylon 6 40 none (density 0.919, (Toray Amilan CM1011) MI = 0.3) 21 Polyethylene 70 Nylon 66 30 none (density 0.959, (Toray Amilan CM3011) MI = 3.5) 22 Polyethylene 50 Polystyrene 50 none (density 0.960, (MI = 3.9) (MI = 6.0) 23 Polyethylene 50 Poly(butene-1) 50 Calcium carbonate (density 0.950, (MI = 10) powder (WHITE p-10)** 20 MI = 0.3) Toray tetron*** 5 24 Polyethylene 70 Polyethylene oxide 30 none (density 0.956, (average molecular weight (MI = 0.3) 2,500,000 - 3,000,000) 25 Polyethylene 50 Ethylene-propylene 50 none (density 0.957, copolymer (ethylene/pro- (MI = 1.7) pylene 50/50 wt.ratio, MI = 5) 26 Nylon 6 50 Ethylene-vinyl acetate 50 none (Toray Amilan CM1011) copolymer (vinyl acetate 15 wt.%, MI = 3) 27 Nylon 6 60 Ethylene-acrylic acid 40 none (Toray Amilan CM1011) copolymer (acrylic acid 20 wt.%, MI = 3) 28 Nylon 66 50 Ethylene-acrylic acid 50 none (Toray Amilan CM3011) copolymer (acrylic acid 20 wt.%, MI = 3) 29 Nylon 66 50 Nylon 6 50 none (Toray Amilan CM3011) (Toray Amilan CM1011) 30 Polyethylene terephthalate 50 Polystyrene (MI = 5) 50 none (Toray Tetron****)

*Product

of Kawaken fine chemical Co. **Product of Shiraishi Kogyo K.K. ***Polyester fibers of 2 denier and 3 mm length. (Product of Toray Industries, Inc.) ****Polyester

fibers of 2 denier were used after melting. (Product of Toray Industries, Inc.)

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File: USPT

Mar 30, 1971

DOCUMENT-IDENTIFIER: US 3572510 A

TITLE: LIQUID-FUEL MONITOR FILTERAbstract Text (1):

An improved filter device employing organic water-soluble resin as the filter material for effectively removing free-water and other contaminants from liquid hydrocarbon fuels and other organic liquids. Also acts as a monitor to completely shut off liquid flow when excessive free-water contaminant is present and the device has filtered to its capacity.

Brief Summary Text (1):

This invention relates to an IMPROVED LIQUID-FUEL MONITOR FILTER which I chose to term the Aqua Sorb Monitor Filter.

Brief Summary Text (2):

The device described herein has a specific application for the removal of free-water content and other extraneous contaminants from hydrocarbon fuels. It can also be equally well employed to perform such filtering action with other organic liquids which are not solvents for the organic filter material. While removing the free-water, my device also removes any dissolved constituents contained therein as well as particulate solid matter. This device also acts as a monitor to shut off the flow of liquid when excess free-water contaminant is present and the device has filtered to its capacity.

Brief Summary Text (3):

The need for filters in liquid-fuel systems is apparent, particularly for aviation turbine, jet, and diesel engine fuels. Combustion can not only be hampered but can be completely extinguished when there is excessive free-water content present in aviation turbine and jet fuels. Diesel engines are now employed almost exclusively in large trucks and trailer-truck tractors, and in railroad locomotives, ships, etc. When the fuel supplied to diesel engines contains an excessive amount of free-water content, operation is very inefficient. Additional expenditures are also entailed since such diesel engines must frequently be completely overhauled by reason of internal damage caused by free-water in the fuel.

Brief Summary Text (4):

Because of the importance of removing free-water from their fuels, provision is commonly made in the fuel systems of such engines for the insertion and use of filters and/or monitors. Several makes and types of filter elements for use in such systems are presently available and being marketed.

Brief Summary Text (5):

Generally, the filter elements available employ cellulose fibrous paper and/or fiberglass as the essential filter matter materials. Organic resin materials such as phenol-formaldehyde or the like are commonly used as binders in such filters. Filters made of these materials do meet minimum requirements-- even those set up in Military Specification MIL-M-8-1380 dated Jun. 22, 1966 for monitoring and removing contamination in fuel dispensing systems for aviation turbine fuel. However,

presently accepted filters employing primarily cellulose and fiberglass materials leave much to be desired but, since nothing better was known, specification requirements and standards necessarily had to be written accordingly.

Brief Summary Text (6):

The present invention envisages a filter element of novel construction and material which operationally far exceeds present specifications and standards in its efficiency.

Brief Summary Text (7):

Applicant has made a discovery which he considers of outstanding importance. He has found that certain materials, heretofore employed for completely different usages, can be utilized as a filter material which far surpasses other presently and commonly used materials for the essentially complete removal of free-water content from hydrocarbon fuels and other organic liquids. In addition, this filter material, which is basically in solid crystalline powdered form as compared to the cellular or fibrous materials heretofore used for such filtering purposes, acts effectively and efficiently as a monitor to completely stop or cut off all passage or flow of liquid when the content of free-water reaches a given maximum value which saturates the filter material. In the meantime and prior to such stoppage, the fuel or organic liquid passing through the filter material is substantially absolved of any free-water contamination. The excellency of this newly discovered filter material has been proven in tests wherein sufficient free-water content has been removed from the liquid being filtered to cause such a monitor shut-off after the liquid had already passed through other highly regarded filters using cellular and fibrous filter materials. This filter material actually, and to all intents completely, removes free-water by an absorption process through which the water bonds with the filter material in such a manner as to combine the two and thereby form a completely new and different physical substance. This change in physical structure is irreversible under normal conditions.

Brief Summary Text (8):

With the foregoing in mind, the primary object of the present invention is to provide a greatly improved filter element for removal of free-water contaminant from hydrocarbon fuels and other organic liquids.

Brief Summary Text (9):

A second object is to provide, inherent in such a filter, means for monitoring and shutting-off the passage or flow of liquid when excess free-water contaminant exists and the filter element has removed its full capacity of free-water content from the liquid being filtered.

Detailed Description Text (2):

FIG. 1 is a view of a filter constructed in accordance with the teachings of the present invention. FIG. 2 is an enlarged cross section, taken on line A-A of FIG. 1. In the cylindrical type of construction shown, physical size and shape are indicated to be generally as set forth in previously mentioned Military Specification MIL-M-8-1380. The entire filter structure is designated as 1. End cap 2 is shaped as shown and is of generally hollow tubular construction, formed or molded from inert plastic material or metal. End cap 3, also formed or molded from the same inert plastic material or metal used for cap 2, completely seals or closes one end of the filter in this construction. In some similar tubular constructions this cap 3 might be open ended. In manufacture end caps 2 and 3 may be an integral part of the main filter structure or may be separate unities firmly attached to the main filter structure. As shown in the cross section view of FIG. 2, the filter element in this construction consists essentially of tubular layers. The innermost supporting tube 4 is simply to provide structural strength and is not a feature of the invention. Tube 4 might conveniently be a molded or tubular formed gridlike structure of material such as inert plastic, metal or fiberglass. Outside of this is another cylinder 5, which may be preshaped or formed as by rolling layers of

cellulose fibrous paper, having an inert resin binder, around inner supporting form 4 or could be molded of fiberglass with a suitable binder. Leaving a substantially uniform open cylindrical space between it and cylinder 5, a preformed cylinder 7, formed as by press-molding from fiberglass, using an inert resin binder, is positioned inside of a protective outer tube 8 which might be a gridlike structure of inert plastic or metal similar to inner tube 4 but of larger diameter or could be simply a plastic or metal screen. Outer tube 8 is included primarily to provide protection in handling and is not essential to operation of the filter. In some other tubular constructions it might be omitted. The otherwise hollow space provided between inner cylinder 5 and outer cylinder 7 in the construction of FIG. 1 and FIG. 2 is completely filled with a filter material 6, basically a solid granular powder, although it might be held in calendered porous tube or sheet form. Filter material 6, preferably an organic water-soluble resin such as a form of polyethylene oxide or the like, is the nucleus of the invention. The cylindrical tubes 5 and 7 act as a means to confine filter material 6 in a tubular layer in this construction.

Detailed Description Text (3):

FIG. 3, FIG. 4 and FIG. 5 of the drawing are included as a means of showing the versatility possible in the physical constructions of this invention, so that it will not be limited in structural form. Operational the filter is the same regardless of its physical formation.

Detailed Description Text (4):

FIG. 3 shows a flat filter construction in the shape of a wafer 21 having a circular edge or rim portion 22. FIG. 4 is a sectional view taken on line B-B of FIG. 3. The circular area enclosed by rim portion 22 might conveniently be covered on both external sides as shown by flat gridlike supporting structures 24-24 of inert plastic or metal or the like. Between grids 24-24 are interposed filters 25-25 similar to filters 5 and 7 of FIG. 1 and FIG. 2, which act to confine the master filter material 6, of identical organic water-soluble resin material used in the other physical constructions of the filter element. Such a wafer-shaped filter construction might be advantageously inserted directly into a pipeline having proper fittings for holding such a filter.

Detailed Description Text (5):

FIG. 5 shows a baglike or cup-shaped filter construction 31 having a flat circular rim 32. Again identical materials are employed, although different in physical shape. Such a filter might, for instance, be inserted at the filler opening or inlet of a fuel tank while it is being filled as by a hose nozzle (such as at a gas station). In this construction the preferably solid powdered form of the polyethylene oxide or like material 6, in order to prevent channeling, might be conveniently honeycombed or pressed in to fill the openings of a screen 39. This screen 39, a section of which is shown in FIG. 6, is outwardly shaped as indicated, is of desired thickness, and is made of inert plastic material, metal, or the like. The confining filter means 35--37 and the external support grid 34 are likewise of the same materials used in the other physical constructions but are shaped or formed as by molding or otherwise to meet the specific requirement of this structure.

Detailed Description Text (6):

To better explain the operation of the presently disclosed filter material, consideration should be given to the characteristics of other more conventional filter materials.

Detailed Description Text (7):

The most commonly used filter materials remove free-water by hydrophobic (repel water) or adsorption (water adheres to outer surface) whereas the filter material which is the basic ingredient of the present invention absorbs water.

Detailed Description Text (8):

The two materials used almost exclusively in prior art filters are cellulose fibrous paper and fiberglass, both being treated with an inert organic resin binder such as phenol-formaldehyde or the like. Neither of these filter materials are very effective for removing free-water from organic liquids by absorption or adsorption. Rather, both materials act to coalesce the small drops or globules of water into large drops thus causing a separation into two liquid phases, providing the organic liquid being filtered is not contaminated with a critical amount of emulsifying agents or surfactants. Unless the filtering system is equipped with a hydrophobic separator the effluent stream can readily be recontaminated from the coalesced water phase. Additional layers of the filter material do help to reduce the amount of remaining free-water. However, the organic liquid filtered through such materials in many cases still contains an appreciable amount of free-water and water-soluble contaminant.

Detailed Description Text (9):

Polyethylene, polypropylene and the copolymers thereof are sometimes used to form a coating on the surface of the fibers of filter materials. These coating materials are hydrophobic or water-repellent. Materials such as activated carbon, Fuller's earth, silica gel and activated alumina used in certain other types of liquid filters are classified as adsorbent.

Detailed Description Text (11):

By comparison, the free-water removed by the presently disclosed water-soluble resin filter material is fully absorbed and completely loses its entity as water since it becomes bonded with the solid granular powder to form a new physical structure. This action occurs in the manner hereinafter described.

Detailed Description Text (12):

Details of the operation of my filter will be here limited to the tubular construction shown in FIG. 1, with it its cross section viewed in FIG. 2 of the drawing.

Detailed Description Text (13):

Obviously the construction could be varied in size and relative shape to meet any other requirements for a tubular construction of the device. Operationally, other constructions such as that shown in FIG. 3 with cross section shown in FIG. 4, and that of FIG. 5 are identical in filter action. Variations in physical construction are shown only to denote the versatility of my filter device so that it can meet varying needs. Also, fuel or liquid flow could equally well be in either direction through the filter device.

Detailed Description Text (14):

The device as depicted in FIG. 1 and FIG. 2, and as physically designed to meet Military Specification MIL-M-8 -1380 operates accordingly and in the following manner. One or a plurality of the filter elements are installed in a housing or encasement designed especially to hold such elements. The aviation turbine fuel, under pressure, flows into such housing externally of or outside of said filter elements, is forced through the elements by reason of exerted pressure, and emanates through the hollow interior of the filter into the pipeline which supplies fuel to the storage tanks in the aircraft which in turn later supply the turbine engines themselves. The liquid fuel therefore passes or flows successively through outer protection tube 8, outer confining filter 7, prime filter material 6, inner confining filter 5 and finally inner supporting tube 4. The fuel then emanates through hollow cap 2 into the pipeline, cap 3 closing off the other end of the filter.

Detailed Description Text (15):

As previously set forth, inner tube 4 is simply a supporting member of the construction and outer tube 8 is included simply to add protection in handling.

Neither are of any import in the operation of the filter. Open-ended cap 2 acts as the path for the effluent flow while, in this construction and this type of flow path, cap 3 simply closes and blocks flow at one end of the filter element.

Detailed Description Text (16):

Actually the only vital part of the filter is the water-soluble resin material 6. However, since some type of liquid-porous material or materials are needed to confine the primary filter material 6, which is basically in solid granular powder form, the material used for the confining tubes 5 and 7 might advantageously be cellulose fibrous paper and/or fiberglass with inert organic resin binders. Thereby, additional preliminary filtering is obtained, particularly in the removal of particulate solids.

Detailed Description Text (17):

Considering the liquid flow to be from outside, inwardly, the preformed pressed fiberglass tube 7 then acts to filter out or remove particulate solid matter from the liquid. It also removes some free-water because of its water-repellent and/or adsorbent ability, even though this is actually not essential. However, free-water does still penetrate the fiberglass material 7 by reason of coalescence (as becomes evident and is readily proven).

Detailed Description Text (18):

The liquids, together with the remaining free-water, other soluble contaminants contained in said water and any remaining particulate solids penetrate through confining filter 7 to the prime filter-- the water-soluble resin material 6.

Detailed Description Text (19):

The solid granular powder 6 acts to remove any remaining particulate solid contaminants but more importantly it removes by true absorption substantially all free-water that passes through the filter confining means 7. The water-soluble resin 6, in solid granular powder form has a strong affinity for water and hydrogen-bonds with it. As this solid powder 6 absorbs and combines with the water it gradually changes its physical construction or form. In so doing it absorbs much more water by weight than its own original weight, yet, until fully saturated allows the passage of hydrocarbon fuels and other organic liquids.

Detailed Description Text (20):

When the amount of excessive free-water penetrating to the filter material 6 reaches the saturation level the surfaces of the particles of powder 6 become cohesive almost immediately. During this period the particles agglomerate on contact and an impervious elastic substance is formed.

Detailed Description Text (21):

This nonporous elastic substance, although resulting from a combination of the solid powder and the liquid water, has altogether different physical properties than either alone. It is physically irreversible under normal conditions and, in this construction, forms a complete cylinder which stops or cuts off all passage or flow of liquid, including the hydrocarbon fuel or other organic fuel being filtered. It thus acts as a monitor to indicate that the free-water contamination limit has been reached. In the meantime, all free-water has been removed and none has passed through the filter into the effluent stream, since it has been combined with and bonded to the powder 6.

Detailed Description Text (22):

It is obvious that confining filter 5 has performed no duty at all in this case except to act as a confining wall for the primary filter material 6 and, of course, to allow the free passage of the liquid being filtered. If flow was reversed, operations of filter 5 and filter 7 would likewise be reversed.

Detailed Description Text (23):

If other suitable material is or becomes available, it can be used, instead of the filter materials 5 and 7, so long as it acts to confine the primary filter material 6 and is porous to the flow of the liquid being filtered, without necessarily filtering out the free-water contaminant content thereof. Only the water-soluble resin in solid granular powdered form is necessary as the free-water filter material.

Detailed Description Text (24):

From the foregoing it will be apparent that the filter action of my device differs considerably from prior art filters in the removal of free-water from an organic liquid. Particularly, the difference lies in the ability of the water-soluble resin material employed by me to bond with the free-water, thus completely removing the water content as such, and thereby forming a substance having markedly different physical properties from either component alone (solid granular powder and water). The elastic substance so formed differs from gels or gelatinous material by reason of its tenacity and this elastic substance, when fully formed, provides, a film or membrane which is impervious to the passage of liquid. Thus the filter device also acts as a monitor since by stopping the flow of the liquid being filtered positive indication is given that the original supply or source contains an excessive amount of free-water content. Such stoppage of flow assures that only fully filtered fuel passes into the storage tank and/or engine.

Detailed Description Text (25):

Since the absorption of free-water by the solid granular powder is cumulative, the usable life of such a filter device is greatly extended when there is only a minimum amount of free-water contaminant in the organic liquid being filtered.

Detailed Description Text (26):

It is to be further pointed out that certain most preferred water-soluble resins which might be employed as the primary filter material in the device of the present invention have an added desirable quality. Although instantly wettable and completely water-soluble, these resins are relatively resistant to sorption of atmospheric moisture at all but the highest relative humidities.

Detailed Description Text (27):

Obviously, since the primary purpose is to remove free-water, the granular powdered resin filter material must be preferentially soluble in water: That is; soluble in water but insoluble in the hydrocarbon fuel or other organic liquid being filtered.

Detailed Description Text (28):

In view of my disclosure it is not contemplated that there shall be any restriction of my invention by reason of size, shape, form or size of physical construction but only that my invention lies in the discovery of a new and unforeseen result in the use of a material not hitherto employed for, or thought of as, and unexcelled filter medium for the removal of free-water from a hydrocarbon fuel or other organic liquid, and a means of employing such a material in a filter device and as a fuel monitor.

CLAIMS:

1. A filter device for removing free-water and water-soluble contaminants contained in said water from hydrocarbon fuels and other organic liquids, comprising a polyethylene oxide as the prime filter material and means for confining said filter material in a predetermined fixed shape.

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L13: Entry 1 of 1

File: USPT

Jul 11, 1978

DOCUMENT-IDENTIFIER: US 4100238 A

TITLE: Process for producing permeable membranes

Brief Summary Text (1):

This invention relates to a process for producing a permeable membrane from a polymer having stretchability, especially a permselective membrane suitable for use as a reverse osmosis membrane, a battery separator, a microbe-free packaging material, a filter, or the like.

Brief Summary Text (49):

If desired, suitable amounts of additives such as a filler (e.g., calcium carbonate, titanium dioxide, clay, magnesium carbonate, barium sulfate, diatomaceous earth or calcium sulfate), a fibrous substance such as polyester, nylon or glass fibers, an antioxidant, an ultraviolet absorber or a plasticizer may be added to components (A) and (B). Furthermore, if desired, the product in accordance with this invention may be subjected to a corona discharge treatment, oxidizer treatment or surfactant treatment.

Detailed Description Text (3):

50 parts by weight of isotactic polypropylene having a melt index of 2 and 50 parts by weight of low-density polyethylene having a density of 0.919 and a melt index of 0.25 were kneaded by a roll at a temperature of 180.degree. C, and formed into a 0.5 mm-thick sheet by a press held at 200.degree. C. Using a tender biaxial stretcher, the sheet was stretched 200% in each of the longitudinal and transverse directions in an air constant temperature tank held at 170.degree. C. The resulting film had N.sub.2 permeability and moisture permeability as low as in ordinary plastic films, and did not have the properties of a permselective membrane, as shown in Table 4.

Detailed Description Paragraph Table (1):

Table 2

Component (A) Component (B) Other component wt. wt. wt. Example Kind part Kind part

11

Polypropylene 30 Atactic polypropylene 70 none (MI = 7) (MI = 5) 12 Polypropylene 50 Nylon 6 50 none (MI = 2) (Toray Amilan CM1011) 13 Polypropylene 60 Poly(butene-1) 40 none (MI = 0.5) (MI = 10) 14 Polypropylene 70 Petroleum paraffin wax 30 none (MI = 0.3) (m.p. = 65.degree. C) 15 Polypropylene 40 Ethylene-propylene 60 Lubricant 5 (MI = 4) copolymer (ethylene/ (VLTN-5*) propylene 70/30 wt ratio, MI = 5) 16 Polyethylene 60 Ethylene-vinyl acetate 40 none (density 0.956, copolymer (vinyl acetate MI = 0.3) 25 wt.%, MI = 3) 17 Polyethylene 90 Petroleum microcrystalline 10 none (density 0.953, (m.p. 70.degree. C) MI = 3.5) 18 Polyethylene 40 Atactic polypropylene 60 none (density 0.943, (MI = 3) MI = 6) 19 Polyethylene 30 Ethylene-acrylic acid 70 none (density 0.956, copolymer (acrylic acid MI = 0.3) 20 wt.%, MI = 3) 20 Polyethylene 60 Nylon 6 40 none (density 0.919, (Toray Amilan CM1011) MI = 0.3) 21 Polyethylene 70 Nylon 66 30 none (density 0.959, (Toray Amilan CM3011) MI = 3.5) 22 Polyethylene 50 Polystyrene 50 none (density 0.960, (MI = 3.9) (MI = 6.0) 23 Polyethylene 50 Poly(butene-1) 50 Calcium carbonate

(density 0.950, (MI = 10) powder (WHITE p-10)** 20 MI = 0.3) Toray tetron*** 5 24
Polyethylene 70 Polyethylene oxide 30 none (density 0.956, (average molecular
weight (MI = 0.3) 2,500,000 - 3,000,000) 25 Polyethylene 50 Ethylene-propylene 50
none (density 0.957, copolymer (ethylene/pro- (MI = 1.7) pylene 50/50 wt.ratio, MI
= 5) 26 Nylon 6 50 Ethylene-vinyl acetate 50 none (Toray Amilan CM1011) copolymer
(vinyl acetate 15 wt.%, MI = 3) 27 Nylon 6 60 Ethylene-acrylic acid 40 none (Toray
Amilan CM1011) copolymer (acrylic acid 20 wt.%, MI = 3) 28 Nylon 66 50 Ethylene-
acrylic acid 50 none (Toray Amilan CM3011) copolymer (acrylic acid 20 wt.%, MI = 3)
29 Nylon 66 50 Nylon 6 50 none (Toray Amilan CM3011) (Toray Amilan CM1011) 30
Polyethylene terephthalate 50 Polystyrene (MI = 5) 50 none (Toray Tetron****)

*Product

of Kawaken fine chemical Co. **Product of Shiraishi Kogyo K.K. ***Polyester fibers
of 2 denier and 3 mm length. (Product of Toray Industries, Inc.) ****Polyester
fibers of 2 denier were used after melting. (Product of Toray Industries, Inc.)

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L17: Entry 1 of 3

File: USPT

Jun 21, 2005

DOCUMENT-IDENTIFIER: US 6908553 B1

TITLE: Composite membrane with particulate matter substantially immobilized therein

Detailed Description Text (20):

In a specific embodiment, membrane 10 is made of a polyurethane and activated charcoal powder. For example, polyurethane is dissolved in a solvent such as N-methylpyrrolidone (NMP). Between approximately 5%-20% by weight of polymer may be combined with approximately 80%-95% by weight of solvent to dissolve the polymer. Preferably, where the polymer is polyurethane the amount of polymer is between about 6%-15% of the total polymer/solvent weight. As used herein, the polymer solution is expressed as the percentage (in weight percent) of the polymer in the solvent. Thus, for example, 10 grams of polyurethane may be combined with 90 grams of NMP to provide a 10% polymer solution. The resulting polymer solution is then combined with the particulate material to form the blend.

Detailed Description Text (22):

After blending the activated charcoal with the polymer solution, the blend is then introduced into the chamber 24 as described above and may be applied to a polyester mesh material supplied from dispensing roll 22. In a preferred embodiment, the blend is applied to both sides of the polyester support, as shown in FIGS. 9 and 10, to achieve a total membrane thickness (film and support), 44, of approximately between 250 and 1000 micrometers (.mu.) and, preferably, 400-1000 micrometers. It has been observed that to achieve a membrane thickness of approximately 400-1000 micrometers (.mu.), gap 40 in chamber 24 should be slightly wider than the desired thickness of the membrane and may measure, for example, between about 600-1200 micrometers. More specifically, it has been observed that to provide a polyurethane membrane with 70% activated charcoal powder having a thickness of about 500 .mu.m, gap 40 should be approximately 705 .mu.m, and to provide a polyurethane membrane with 70% activated charcoal powder having a thickness of 1000 .mu.m, gap 40 should be approximately 1105 .mu.m. The membrane 10 is then introduced into coagulation bath 26 which, in the case of the polyurethane/activated charcoal blend described above, may include only water. As presently understood, exposure of the blend to water causes the polymeric blend to coagulate (because polyurethane is not miscible with water). As coagulation of the polymer proceeds, solvent NMP leaves the polymer in exchange for water. Further removal of solvent from the membrane occurs as the membrane is successively introduced to and removed from a series of extraction baths 28.

Detailed Description Text (26):

Other solutions may also be used to treat the membrane 10 and make it more hydrophilic. Specifically, solutions including sodium chloride are suitable, including solutions that include 0.45% NaCl or 0.9% NaCl. This may include, for example, solutions commonly used in the storage of red blood cells, such as Adsol.RTM. (described in U.S. Pat. No. 4,267,269 incorporated by reference herein). Still other solutions that may be used to treat the membrane include 1-10% glycerol in isopropyl alcohol, polyethylene oxide (PEO) and/or blends of PEO and polyurethane in 70/30, 50/50, 30/70, isopropyl alcohol/water solutions. Where the membrane is used with a biological fluid, such as blood, membrane 10 may also be treated with an agent that further improves the hemocompatibility of the membrane relative to retain compounds or biological components. One such agent is

polyhydroxyethylmethacrylate or PHEMA. In any event, the membrane 10 may be treated with the above described solutions prior to or after drying. .

Detailed Description Text (27):

Membranes made in accordance with the present invention provide a unique and cost effective way of immobilizing fine particulate powder that is typically difficult to handle and prone to shedding. This is particularly advantageous in the field of blood therapy where introducing foreign particles into the blood or other biological fluid is considered undesirable. The membranes made in accordance with the present invention are also unique, in part, because the particulate is substantially captured by the polymer matrix without compromising the ability of the powder to act as a sorbent for organic compounds used in pathogen inactivation treatments. As presently understood, the fine powder is widely dispersed across the polymeric matrix and, therefore, provides a multitude of sorption sites for the molecules of the organic compounds. The broad dispersal of powder may also mean that molecules of the organic compounds will have to travel shorter distances before they are captured by the sorbent powder.

Current US Cross Reference Classification (4):

210/500.36

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<u>L5</u>	carbon block and polyethylene and alkali	46	<u>L5</u>
<u>L4</u>	L3 and sodium hydroxide	1	<u>L4</u>
<u>L3</u>	carbon block and polyethylene oxide	17	<u>L3</u>
<u>L2</u>	carbon block and polyethylene oxyde	0	<u>L2</u>
<u>L1</u>	canbon block and binder and polymer and polyethylene oxide	0	<u>L1</u>

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L3: Entry 4 of 17

File: USPT

Jul 27, 1999

DOCUMENT-IDENTIFIER: US 5928588 A

TITLE: Porous filter structure and process for the manufacture thereof

Brief Summary Text (7):

In the dry process, the components are first dry blended, followed by densification and heating of the dry mixture into different forms and shapes. The current state of the dry process art is exemplified by the following patents. U.S. Pat. No. 4,664,683 issued to Pall Corporation teaches the use of molding carbon blocks with particle sizes from about 200 to 2000 microns. The maximum molding pressure is 400 psi. The particle size of the polyethylene powdered binder employed is about 8 to 30 microns. The preferred binding pressure is from 0.3 to 10 psi. The binding temperature is about 50 to 90.degree. F. (28 to 50.degree. C.) above the Vicat softening temperature. These temperatures are equal to or below the melting temperature of the binder. The carbon and binder mixture is heated within the mold and then pressed for 1 to 2 minutes. The cooled carbon block is removed from the mold and found to be self-supporting. The filter blocks have poor physical strength due to the lack of efficient binding between the binder and the carbon particles.

Detailed Description Text (3):

With respect to the primary separation media, it can be one or several types of particles or fibers in mixtures that function as the porous matrix. Preferably, the primary media is selected from the group consisting of carbon particles, diatomaceous earth, perlite, activated alumina, silica, zeolites, natural fibers, and man made fibers. Powdered carbon is typically selected to form a carbon block porous structure and comprises 10 to 400 microns particle size. For a general description of suitable carbon, see U.S. Pat. No. 4,859,386, the subject matter of which is incorporated herein by reference. Activated carbon is available from Calgon, Barnebey and Sutcliffe, etc. Sizes for the other particulate media are generally well known to those skilled in the art and thus, do not constitute a limitation to the practice of the present invention. Similarly, fiber dimensions, i.e., denier, length, diameter and the like can also be varied as is known for the manufacture of various porous structures based upon fibrous media.

Detailed Description Text (8):

Other types of green strength agents include liquid green strength agents such as latexes and resin solutions. Styrene-butadiene, poly(ethylene-vinyl acetate), and acrylate types of latexes are good candidates. Aqueous resin solutions made of water soluble polymers, such as methyl-cellulose and hydroxypropyl methyl-cellulose, carboxymethyl cellulose, hydroxyethyl cellulose, polyvinyl alcohol, polyvinyl pyrrolidone, polyacrylic acid, polyethylene oxide, polyethyleneimine, polyacrylamide, natural gums and their copolymers and derivatives can also be employed, separately or in mixtures. Even small amounts of water can be used to soften the dry powdered thermosetting binder resins, such as phenol-formaldehyde and melamine-formaldehyde resins, to improve green strength and thus, water can be employed as a green strength agent.

Detailed Description Text (75):

The contribution of fibrillated fiber, namely polyethylene (PE), on green strength of the carbon block was demonstrated by formulating carbon, PE fiber and PE powder utilizing the following ingredients:

Detailed Description Text (82):

Three porous structures (carbon blocks) were manufactured utilizing the following ingredients:

Detailed Description Text (95):

Four porous structures (carbon blocks) were manufactured utilizing the following ingredients shown in Table VII. The length was about 2.42 inch, the O.D. was 1.75 inch and the I.D. was 0.375 inch. The blocks were molded at 6,000 lb force, and baked at 141.degree. C. for 45 minutes. The radial air flow resistance was measured at constant flow of air at the rate of 135 SCFH through a 0.625 inch slice of filter donuts. In these examples, both PE fiber and powder melted as binder materials and the effect of PP fiber reinforcement can be seen by comparing Example Nos. 31 to 33 (1 to 3% fiber) with No. 30 containing no fiber, namely, approximately a 50 to 60 percent increase in final product strength, as indicated by the collapse force test.

Detailed Description Text (189):

The porous structures representing Examples No. 34 to 50 were tested against a slice of KX 1 M carbon block and are reported in Table VIII. The radial air flow resistance was measured at constant flow of air at the rate of 50 SCFH through a 0.625 inch slice of filter donuts.

Detailed Description Text (191):

Thus it should be evident that the process of the present invention is highly effective in the manufacture of porous structures. The invention is particularly suited for the production of carbon block structures e.g., filters, having high separation (filter) media weight and relatively low binder weight, but is not necessarily limited thereto. The process of the present invention can be employed with a variety of equipment, and component materials. Similarly, the separation media made according to the process need not be limited to powdered carbon media. Nor, is shape of form of the porous structures a limitation of the present invention inasmuch as flat sheets; flat structures; cylindrical structures, open at both ends or closed at one end and, virtually any geometrically shaped structures, solid as well as hollow, can be formed. Moreover, the exterior surfaces of the porous structures can be widely varied.

Detailed Description Paragraph Table (5):

TABLE V															CARBON BLOCK METHYLENE CHLORIDE	
REDUCTION AND COLLAPSE TESTING BAKING THROUGHPUT COLLAPSE FORCE EXAMPLE TIME AT 15																
OF 0.625 INCH NO. MIN. PPB, GALLON SLICE, LB																
21	25	20	67	22	45	26	110	23	55	14	94	24	(KX)	N/A	24	79

Detailed Description Paragraph Table (6):

TABLE VI																
CARBON BLOCK ACFTD AND COLLAPSE TESTING TURBIDITY (NTU) 5/8 INCH SLICE .DELTA.P,																
PSI AT GRAM LIFE REDUCTION PARTICULATE BAKE COLLAPSE EX. NO. 0.6 GPM ACFTD, G																
EFFICIENCY, % REDUCTION 1-5 .mu.M, % TIME MIN. FORCE, LB.																
															25	2.60
6.15	96.3-98.3	99.33-99.51	40	86	+-.	7	26	2.00	5.11	95.1-97.4	97.45-99.56	45				
90	+-.	5	27	2.00	3.65	97.5-98.5	98.95-99.81	50	91	+-.	5	28	(KX)	6.60	3.20	96.8-
97.9	99.54-99.86	N/A	124	+-.	3	28	(KX)	0.90	4.87	71.3-97.1	86.99-98.34	N/A	99	+-.	9	

Detailed Description Paragraph Table (7):

TABLE VII										CARBON	
BLOCK EXAMPLES AND PROPERTIES AIR FLOW COLLAPSE % OF % OF 3049 RESISTANCE OF FORCE											
OF % OF 3 DENIER 1/4 INCH % OF 13040F FASP007 PE TYPE OF B&S 0.625 INCH 0.625 INCH											

EX. NO. MINIFIBER PP FIBER PE FIBER POWDER CARBON SLICE, INCH H.sub.2 O SLICE, LB
11 85 75 97 31 1 4 11 84 68 144 32 2 4 11 83 67 162 33 3 4 11 82 59 168 30 0 4

CLAIMS:

24. A process for the manufacture of porous structures, as set forth in claim 23, wherein said liquid green strength agents are selected from the group consisting of styrene-butadiene, poly(ethylene-vinyl acetate), and acrylate latexes; methyl-cellulose and hydroxypropyl methyl-cellulose, carboxymethyl cellulose, hydroxyethyl cellulose; polyvinyl alcohol; polyvinyl pyrrolidone; polyacrylic acid; polyethylene oxide; polyethyleneimine; polyacrylamide; natural gums and copolymers thereof; water and mixtures with one or more of the foregoing liquid green strength agents.

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L4: Entry 1 of 1

File: USPT

Mar 21, 1972

DOCUMENT-IDENTIFIER: US 3650836 A

TITLE: ELECTROCHEMICAL CELL WITH AT LEAST ONE GAS DIFFUSION ELECTRODE

Detailed Description Text (11):

Suitable thickening agents which have the above properties and can be employed in the practice of this invention and are swellable in an aqueous alkaline electrolyte include the polymers of acrylic acid, carboxy polymethylene, carboxymethyl cellulose, methyl cellulose, algin, polyethylene oxide, polyvinyl alcohol, and mixtures thereof. Suitable thickening agents which can be employed in the practice of our invention and are swellable in an aqueous acid electrolyte include the polymers of acrylic acid, carboxy polymethylene, algin, pectin, polyvinyl alcohol, carboxymethyl cellulose, and mixtures thereof.

Detailed Description Text (16):

A porous carbon block with dimensions of 1/2 .times. 1/2 .times. 1 1/2 inch was wet-proofed with 9 weight percent of polyethylene. The block was incorporated into an electrochemical cell structure as in the single FIGURE of the drawing. The cell was filled with an aqueous 6 molar methanol, 13 normal potassium hydroxide solution. The cell was placed on a resistive load. After 600 hours the cell showed carbonate crust formation on the air-exposed surface of its cathode. After 1,400 hours, the cell showed massive carbonate crust formation and was producing only 15 percent of its initial voltage under load.

Detailed Description Text (18):

A porous carbon block as in Example I was drilled out with a 3/8 inch diameter drill to within about 1/8 inch of one end forming a long cup shaped piece. This was wet-proofed with 10.6 weight percent polyethylene. After wet-proofing, the outer surface of the porous carbon was masked with a mask impervious to fuel, electrolyte and oxygen except for an area 1 inch .times. 1/2 inch later to face the anode in the structure shown in the single FIGURE of the drawing. The unmasked surface was coated with a layer of gel by applying two successive coats of a mucilage prepared by dissolving 2.5 percent of a carboxylated polymethylene polymer in water. The layer was dried between coats and after the second coat. This cathode was incorporated into an electrochemical cell structure similar to the single FIGURE of the drawing and placed on resistive load. After 600 hours this cell showed no crust formation and there had been no leakage of electrolyte into the cup-shaped cathode. It was delivering 97 percent of its initial voltage under load. After 1,500 hours, there was no crust formation and the cell was producing 56 percent of its initial voltage under load.

CLAIMS:

5. In an electrochemical cell as in claim 1, wherein the gas diffusion electrode is porous carbon, the thickening agent is carboxy polymethylene polymer, the electrolyte is sodium hydroxide, the fuel is methanol, and the alkali metal silicate is sodium metasilicate.

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